

IN THE UNITED STATES DISTRICT COURT FOR THE  
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his )  
capacity as ATTORNEY GENERAL )  
OF THE STATE OF OKLAHOMA and )  
OKLAHOMA SECRETARY OF THE )  
ENVIRONMENT C. MILES TOLBERT,) )  
in his capacity as the )  
TRUSTEE FOR NATURAL RESOURCES) )  
FOR THE STATE OF OKLAHOMA, )

Plaintiff, )

vs. )

4:05-CV-00329-TCK-SAJ

TYSON FOODS, INC., et al, )

Defendants. )

- - - - -

VOLUME I OF THE VIDEOTAPED  
DEPOSITION OF CHARLES COWAN, PhD, produced as a  
witness on behalf of the Plaintiff in the above  
styled and numbered cause, taken on the 17th day of  
February, 2009, in the City of Tulsa, County of  
Tulsa, State of Oklahoma, before me, Lisa A.  
Steinmeyer, a Certified Shorthand Reporter, duly  
certified under and by virtue of the laws of the  
State of Oklahoma.

## A P P E A R A N C E S

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I N D E X

| W I T N E S S                  | P A G E |
|--------------------------------|---------|
| CHARLES COWAN, PhD             |         |
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1 Q Okay, and can you tell me what the general  
2 nature of that litigation is involving?

3 A Sure. When -- several years ago UPS bought  
4 Mailboxes, Etc. Several of the franchisees for  
5 Mailboxes, Etc., felt that the purchase wasn't in 09:12AM  
6 their best interest, that they weren't being  
7 adequately compensated or represented by the new  
8 combined entity, and so they are suing for lost  
9 profits and lost business opportunities.

10 Q And that case does not involve environmental 09:12AM  
11 matters; correct?

12 A No, it does not.

13 Q Have you ever been deposed in a case that  
14 involves environmental matters?

15 A Several times. 09:12AM

16 Q Okay. Could you identify those for us,  
17 please?

18 A Sure.

19 Q And when you do that, if you could just tell  
20 us the type of environmental issues involved 09:12AM  
21 briefly, that would be help -- be helpful.

22 A Sure. Most of the cases have involved  
23 groundwater or airborne contamination around a plant  
24 or a -- some other type of facility that had some  
25 type of discharge. In those cases, the contaminant 09:13AM

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1 was typically something like fertilizer that had  
2 leached into groundwater, had been spreading over  
3 time, and the claims were that the contamination  
4 diminished the value of properties that were in the  
5 path of the groundwater.

09:13AM

6 Q And was your role an economic analysis or an  
7 environmental analysis in those cases?

8 A Economic.

9 Q Have you had any cases where you've actually  
10 done an environmental analysis as an expert?

09:13AM

11 A No.

12 Q So this is your first case where you've done  
13 an environmental statistical analysis as an expert?

14 A I'm not sure how to understand your question.

15 Q Well, I just -- you testified that the four or  
16 five cases that you've been deposed involving  
17 groundwater and airborne contamination, you were  
18 doing an economic analysis for the litigants in that  
19 case; correct?

09:14AM

20 A Yes.

09:14AM

21 Q In this particular case, are you doing an  
22 economic analysis?

23 A No.

24 Q Okay. Aren't you evaluating statistically the  
25 environmental data that's associated with the claims

09:14AM

1 in this case?

2 A No.

3 Q What are you doing in this case?

4 A I'm evaluating the quality of the statistical  
5 analysis that was done by Dr. Olsen. I'm not doing 09:14AM  
6 a separate statistical analysis.

7 Q Okay.

8 A And then to answer the first question you  
9 asked, in each of those cases, I had to determine  
10 what was the environmental impact, what was the 09:14AM  
11 spread of the contaminants. Plus, you didn't allow  
12 me to finish my description. So in those cases, you  
13 couldn't do the economic analysis absent any  
14 knowledge of what the environmental contamination  
15 was. 09:15AM

16 Q But in those cases, and I'm just trying to  
17 broad brush it. If not, we'll go individually. In  
18 those cases, were you personally evaluating the  
19 sources of contamination and the scope and extent of  
20 the contamination? 09:15AM

21 A No.

22 Q So you relied on the statements of other  
23 experts and then did your evaluation; correct?

24 A I did.

25 Q Okay. So what I'm trying to hone in on here, 09:15AM

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1 Dr. Cowan, is whether or not this case is the first  
2 time that you've actually evaluated the  
3 environmental data from a statistical perspective?

4 A And I just answered that question and said no,  
5 it's not. In each of the other cases I had to  
6 evaluate the environmental data that I was given and  
7 work with hydrologists and experts like that to be  
8 able to determine what they were telling me and what  
9 their analysis was before I could conduct my  
10 analysis.

09:15AM

09:15AM

11 Q In these previous cases, did you actually  
12 critically review the environmental data; that is,  
13 did you look at the statistical analysis provided by  
14 the experts that were identifying sources in those  
15 cases and do a critical review in those cases?

09:16AM

16 A I did because, otherwise, I couldn't know how  
17 valid or reliable my economic analysis was.

18 Q Okay. Would you tell me about the first case  
19 in the most recent past that involved either -- you  
20 said there was four or five, so let me go through  
21 those. Let's go from the most recent and go  
22 backwards. Okay?

09:16AM

23 A Okay.

24 Q So what would be the most recent case you've  
25 -- involving environmental contamination you've

09:16AM

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1 worked on?

2 A There was a case involving Conoco in  
3 Pensacola, Florida, where it was Conoco, Agrico and  
4 a third company that had gone out of business, so it  
5 was primarily Conoco and Agrico. They jointly 09:16AM  
6 operated a site which produced fertilizer, among  
7 other things, and they -- over time rainwater or  
8 rain had caused fertilizer to go into the  
9 groundwater and then had spread through the area  
10 where -- in Pensacola down into a large bayou, which 09:17AM  
11 fronted onto the ocean, but the bayou was important  
12 because of all the properties that ringed the bayou  
13 having unique values relative to the rest of the  
14 city.

15 Q Okay. In that case did you do a critical or 09:17AM  
16 were any of your opinions -- let me strike that. In  
17 that case did you offer any opinions as to the  
18 source of the contamination?

19 A Well, that source was a given because of the  
20 nature -- 09:18AM

21 Q So the answer is no?

22 A -- of the lawsuit. No.

23 Q Okay, and in that case did you offer any  
24 opinions concerning the fate and transport of the  
25 contamination that was involved? 09:18AM

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1 A I did.

2 Q And what was your opinion involving that case?

3 A Well, there were actually two analyses done,  
4 one for the plaintiffs and one for the defendants.

5 Q And you were working for who? 09:18AM

6 A The defendants.

7 Q Okay, and what was your analysis with regard  
8 to fate and transport in that case?

9 A Well, the problem was that the two analyses  
10 were so incredibly different from one another, that 09:18AM

11 I had to determine what was a reasonable analysis

12 and what was a reasonable analysis on their point

13 that could then be used to determine the likelihood

14 of diminution of value in properties, and so I was

15 contrasting and working with the two opinions or the 09:19AM

16 two reports to come to some midpoint.

17 Q Okay. So you tried to determine what the  
18 central tendencies of each of the opinions is so you  
19 could come up with a mean or a midpoint between  
20 those two? 09:19AM

21 A A little broader than that because I needed to  
22 know how reliable. It wasn't so much the central  
23 tendencies because both reports agreed on that. It  
24 was where the edges were.

25 Q Okay. Did you actually critically review the 09:19AM

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1 analysis of fate and transport of the fertilizer in  
2 the groundwater or were you simply given that as the  
3 two different sides, opinions and try to determine  
4 what the central tendency -- or excuse me, what the  
5 midpoint was between the two?

09:19AM

6 A I was given the reports and I analyzed those.

7 Q Okay. So you took the data. You didn't  
8 actually express an opinion on whether or not  
9 fertilizer actually did move in a certain direction  
10 in the groundwater from the plant in question, did  
11 you?

09:20AM

12 A Not in that case.

13 Q Okay. In front of you -- could you identify  
14 what the exhibit in front of you is marked as Cowan  
15 Exhibit No. 1 right here?

09:20AM

16 A That's my rebuttal report.

17 MR. TODD: Take a minute to just flip  
18 through it.

19 Q Yeah. You might want to take a moment just to  
20 make sure because I may characterize something, but  
21 I want to make sure that you agree with my  
22 characterization.

09:20AM

23 A Yes, sir.

24 Q And while you're going through there, what I  
25 want you to do is, if you would for me, identify in

09:20AM

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1 the report any reference you have, maybe in your  
2 experience or CV, that discusses the case that you  
3 just mentioned.

4 A Okay. I've read through the report. It is,  
5 as nearly as I can tell, my complete report. If you 09:21AM  
6 go to Page 71, which is the second to the last page  
7 in the report, I list jointly three cases that were  
8 property value diminution cases and the last one  
9 listed is Bernice Samples versus Conoco, Agrico and  
10 Escambia Treating. That was the case we were just 09:21AM  
11 discussing.

12 Q Excuse me a second. It turns out the copy I  
13 had in front of me didn't have Pages 71 and 72.

14 MR. TODD: David, is this an additional  
15 copy? 09:22AM

16 MR. PAGE: Yes, that is. Now this one  
17 doesn't have 71 or 72.

18 Q Could you then direct my attention on 71?

19 A 71, the third to the last paragraph, toxic  
20 tort, the last two full lines -- well, the last 09:22AM  
21 three full lines, Bernice Samples versus Conoco,  
22 Agrico and Escambia Treating, is the case we were  
23 just discussing.

24 Q So in that case you were offering opinions on  
25 diminution in value; correct? 09:22AM

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1 A Among other things, yes.

2 Q Well, did you actually testify in court in  
3 that case?

4 A No. Well, there was a deposition. It didn't  
5 go to trial. 09:22AM

6 Q Okay. Is it still pending?

7 A No. It settled.

8 Q Okay. Now, the next most recent case, again,  
9 involving environmental matters, if you could,  
10 identify that for us, please, sir. 09:23AM

11 A There was a case before that also in Florida  
12 that was also a toxic tort case. It was actually  
13 quite similar. It also involved Agrico, but it was  
14 in Lakeland, Florida and, again, it had to do with  
15 fertilizer and contamination of groundwater. 09:23AM

16 Q And what were your opinions in that case?

17 A Similar, in that I was looking for diminution  
18 in value.

19 Q Okay. So your primary focus was to evaluate  
20 the diminution in value of the property in both of 09:23AM  
21 these cases, was it not?

22 A It was, although I'd like to correct something  
23 I said a minute ago. I'd not thought about this,  
24 but this will come up in the third case, too. In  
25 terms of sources, I was also -- as part of the 09:23AM

1 analysis that I conducted, I had to look at sources  
2 because in Pensacola, there was a large naval base  
3 which was also a source of groundwater  
4 contamination.

5 Q Okay, but did you -- were you the expert that 09:24AM  
6 was principally involved with identifying what or  
7 which were the sources of contamination in those  
8 cases?

9 A Well, I was one of them in terms of -- my  
10 interest and my involvement had to do with the 09:24AM  
11 diminution in value as opposed to the  
12 environmental --

13 Q Right, but if I got a copy of those reports in  
14 that case, would it identify an analysis by you of  
15 which were the primary sources of the contamination 09:24AM  
16 and your basis for that?

17 A If you mean from an environmental  
18 perspective --

19 Q Yes.

20 A -- no. From an economic perspective, yes. 09:24AM

21 Q Okay. So from an environmental perspective,  
22 you didn't identify sources in any of these cases;  
23 is that correct?

24 A In the two cases we've discussed so far.

25 Q Okay, and can you identify this Lakeland, 09:24AM

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1 Florida case discussion in your Exhibit 1 to this  
2 deposition?

3 A It's also in the same paragraph on Page 71.

4 Q So you refer to these as toxic tort in your  
5 CV; correct?

09:25AM

6 A Yes, sir.

7 Q Okay. The next case, sir?

8 A It goes --

9 Q My count it's the third case.

10 A Mine, too.

09:25AM

11 Q Good.

12 A Excuse me. I'm thinking about timing so I can  
13 get this chronologically.

14 Q If you don't get it perfect, that's okay.

15 A Okay. Thank you. Because there are two cases

09:25AM

16 at about the same time but they were quite different

17 from one another. The -- excuse me. They're in St.

18 Petersburg, Florida, Pinellas County. There was a

19 phosphorus plant owned by a company called Stouffer,

20 spelled like the food company. This was a class

09:25AM

21 action against Stouffer because Stouffer had

22 purchased the phosphorus company, and under Florida

23 state law they had purchased it for the purpose of

24 cleaning it up, and then they were going to resell

25 it, but their primary mission in life was to

09:26AM

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1 remediate environmental properties.

2 During the cleanup of the phosphorus, the  
3 phosphorus exploded and there was a huge cloud of  
4 phosphorus in the air. It -- there was airborne  
5 contamination, and the question was both -- well, 09:26AM  
6 primarily diminution in value for the properties  
7 that were around this phosphorus plant.

8 Q And was that the primary focus of your opinion  
9 in those two cases, the diminution in value of the  
10 property? 09:26AM

11 A Okay, but we're up to three.

12 Q Oh, I'm sorry. You said there were two  
13 similar. So we're only talking about one now.

14 A Oh. Just the phosphorus case, yes.

15 Q Okay. So St. Petersburg, Florida was the 09:27AM  
16 third case?

17 A Yes, sir.

18 Q Was a phosphorus plant where the purchaser was  
19 to remediate the facility; correct?

20 A Yes. 09:27AM

21 Q And there was an explosion?

22 A Right.

23 Q In that case was your primary focus of your  
24 opinion the diminution of value of the properties  
25 surrounding the plant? 09:27AM

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1 A Yes, sir.

2 Q Okay. Did you do any evaluation as to the  
3 scope and extent, that is, were you primarily  
4 responsible for the evaluation and scope and extent  
5 of the contamination that was involved in that case?

09:27AM

6 A No.

7 Q What's -- is that one -- is that particular  
8 case identified in your CV, sir?

9 A That's the third one listed under the heading  
10 toxic tort.

09:27AM

11 Q Thank you, sir. Okay. Can we go to No. 4,  
12 please?

13 A Sure. In Scottsdale, Arizona, there was a  
14 plant -- this was a long time ago, so I don't think  
15 this is a secret anymore. Motorola has a plant  
16 where it produces circuit boards, and for the  
17 circuit boards -- once the circuit boards are  
18 etched, they're cleaned with a chemical solution,  
19 and the chemical solution ran into the groundwater.

09:28AM

20 The plant had been in operation for 40 years.

09:28AM

21 Q Do you know what chemical solution was  
22 involved?

23 A I don't remember off the top of my head.

24 Q That was the principal contaminant?

25 A Yes.

09:28AM

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1 Q You don't recall what the contaminant was?

2 A Well, we're talking about fifteen years ago.

3 Q Okay.

4 A So if I were allowed to go back and look at my  
5 records, I would, but I don't. 09:28AM

6 Q I'm just checking --

7 A Okay.

8 Q -- what you understood today. So you -- the  
9 issue was the groundwater contamination of some  
10 cleaning elements for the circuit boards at the 09:28AM  
11 Motorola plant?

12 A Yes.

13 Q Okay.

14 A And then the EPA one day decided that that  
15 chemical was a -- the chemical in the cleaning 09:28AM  
16 solution was a carcinogen, and so there were the  
17 beginnings of a class action suit being filed  
18 against Motorola for contaminating the groundwater,  
19 and I was asked to determine the likelihood of --  
20 the likelihood and number of people who were exposed 09:29AM  
21 from a medical perspective to this carcinogen and  
22 what would be the likely outcomes.

23 Q Okay. So you -- would you characterize your  
24 analysis as epidemiological in that particular case  
25 or how -- what would you characterize that? 09:29AM

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1 A It was a combination of epidemiology and  
2 demography.

3 Q Demography, okay. Did any of your work in  
4 that case or, excuse me, your opinions in that case  
5 involve determination of scope and extent of these 09:29AM  
6 cleaning solvents in the environment?

7 A I don't know what you mean by scope, but  
8 certainly the extent.

9 Q Okay, but you didn't do that yourself; you  
10 relied on other experts to tell you how far the 09:30AM  
11 expanse was of the contaminants in the groundwater;  
12 is that not correct?

13 A Well, I worked with them, yes, but I relied --  
14 I relied on the work that they did. I worked with  
15 them as they were beginning to get into this. 09:30AM

16 Q But you weren't the one that modeled, for  
17 example, the cleaning solvents in the groundwater;  
18 correct; you didn't do that analysis?

19 A Well, I'm having trouble responding to your  
20 question because if you're talking about modeling of 09:30AM  
21 the cleaning solvents in the water, no. If you're  
22 talking about the extent of the dilution and how far  
23 out it spread, yes.

24 Q You did the calculations on the dilution?

25 A I worked with the hydrologists on it. 09:30AM

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1 Q Okay. Were you -- did you give an opinion on  
2 the solution, or did the hydrologists provide the  
3 opinion on the dilution of these contaminants in the  
4 groundwater?

5 A I gave a slightly different opinion in terms 09:30AM  
6 of the impact of the solution after I relied on it  
7 from the --

8 Q Right?

9 A Okay.

10 Q Okay. And that analysis provided or is that 09:31AM  
11 case discussed in your CV that's in Exhibit No. 1?

12 A No.

13 Q Why not?

14 A It never got far enough that the -- that it  
15 was filed. There was just initial discussions about 09:31AM  
16 it. So I was hired to do the epidemiological work.

17 Q So that was your primary focus was  
18 epidemiology in that case?

19 A Well, that and the demography. You couldn't  
20 -- the two different -- it's two different bags of 09:31AM  
21 tools.

22 Q When you say demography, you're talking about  
23 the characteristics of the populations of  
24 individuals or people in the area?

25 A Yes, sir. 09:31AM

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1 Q Thank you. Now, did you give your deposition  
2 in that fourth case from Scottsdale, Arizona?

3 A No, I did not.

4 Q Okay. In these first four cases we've  
5 discussed, did you provide a written report?

09:31AM

6 A Yes.

7 Q Do you still have those written reports?

8 A I'm not sure about the Pensacola case, and the  
9 other three, no.

10 Q Okay. Would you have any objections to  
11 checking and providing those to your counsel so you  
12 could provide me copies of any reports you still  
13 have available?

09:32AM

14 A I'd be happy to.

15 MR. PAGE: I'd like to make that request.

09:32AM

16 MR. TODD: Sure. I'd just ask that you put  
17 it in writing after the deposition.

18 MR. PAGE: You bet.

19 MR. TODD: We'll be happy to look into  
20 that.

09:32AM

21 MR. PAGE: You bet.

22 Q On the other three cases, on the Conoco case I  
23 think you mentioned it was fertilizer. What were  
24 the chemicals of concern in the first case we talked  
25 about, the one that's just recently?

09:32AM

1 A The Pensacola case, that's the most recent  
2 case.

3 Q Yes, sir. What did I say? Did I say Agrico?  
4 Excuse me.

5 A No. That's okay.

6 Q Conoco and the Pensacola, yes, sir.

7 A Right. Okay. Well, there was -- this is one  
8 of the reasons why there was some source confusion  
9 in this case. The primary concern about the  
10 fertilizer was ammonia. However, the problem in the 09:33AM  
11 groundwater contamination that was discovered after  
12 you got up to the bayou was uranium, which is -- as  
13 far as we could tell wasn't part of the production  
14 process for Conoco or Agrico.

15 Q So when you did your evaluation of diminution 09:33AM  
16 of value, which chemical were you considering?

17 A Well, as an economist, you wouldn't consider  
18 one specific chemical. You would consider their  
19 cumulative effect.

20 Q Okay.

21 A And what impact they had on the values of the  
22 properties.

23 Q So you were acting as an economist in that  
24 case?

25 A Yes. 09:34AM

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1 Q Okay, and on the Agrico-Lakeland case, that  
2 was I think the second one we talked about?

3 A Yes, sir.

4 Q What were the chemicals of concern in that  
5 case?

09:34AM

6 A Same issue because it's fertilizer. So,  
7 again, the primary one I remember is ammonia, but  
8 there was no uranium involved in that one.

9 Q Okay, and what about the St. Petersburg,  
10 Florida plant; what were the chemicals of concern  
11 involved in that case?

09:34AM

12 A Well, since it was a phosphorus plant,  
13 phosphorus.

14 Q It was phosphorus, okay. And was there any  
15 residual phosphorus in the environment that you  
16 evaluated or was it simply the effects of the  
17 initial explosion that you were concerned with in  
18 that case?

09:34AM

19 A I don't know how to answer your question  
20 because are you talking about residual phosphorus as  
21 phosphorus or are you talking about residual  
22 phosphorus after it's combined with something else?

09:34AM

23 Q Yeah, after it's combined, the results of the  
24 combustion.

25 A Okay. That's good because if it hadn't

09:35AM

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1 combined, it would still explode.

2 Q Yeah, well, it wouldn't be in the environment  
3 naturally, would it be, phosphorus?

4 A No, because if it --

5 Q If it's exposed to air, it immediately 09:35AM  
6 combusts; correct?

7 A Yes.

8 Q Okay. So what were the chemicals of concern  
9 after the explosion in the St. Petersburg, Florida  
10 plant? 09:35AM

11 A I don't recall.

12 Q Okay, and Scottsdale, you just remember it was  
13 a cleaning agent; you don't recall what it was?

14 A No. In both of these cases we're talking  
15 fifteen years ago, so -- 09:35AM

16 Q And you also -- okay, and there was a fifth  
17 case you said that involved some environmental  
18 contamination involvement.

19 A This was a case involving a dry cleaner and  
20 the remediation of or the -- how -- it's not a 09:35AM  
21 single shop. It's a large chain of dry cleaners and  
22 how they dealt with the requirements to take care of  
23 the discharge from dry cleaning.

24 Q Okay, and do you remember the location where  
25 this case occurred? 09:36AM

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1 A Florida.

2 Q Florida, okay. And what was your role in that  
3 case, sir?

4 A I was supposed to determine whether or not the  
5 cleaner had been deceptive in the way that they 09:36AM  
6 worked with both the State and with their consumers.  
7 So it was a deceptive sales practices case in terms  
8 of how they worked with the State and the consumer  
9 in the way they dealt with the contaminants that  
10 would result from dry cleaning. 09:36AM

11 Q Okay. Did your work in that case involve an  
12 evaluation of the scope and extent of contamination?

13 A No.

14 Q Do you recall where the contamination was in  
15 that case? 09:36AM

16 A Well, what I said was --

17 Q It was more a record keeping kind of a case;  
18 is that what it was?

19 A It was more of a record keeping case because  
20 it was every dry cleaner for this large corporation, 09:37AM  
21 but we're talking about hundreds of locations.

22 Q So your evaluation was more of a records  
23 analysis to see if they properly reported their  
24 disposal or management of their cleaning fluids?

25 A No. It was actually how they dealt with the 09:37AM

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1 State in terms of the reporting to the State about  
2 the costs for remediation, what they had done to  
3 adhere to state law and then how they dealt with  
4 that in their pricing for consumers.

5 Q But was it mostly evaluation of their records 09:37AM  
6 -- of what they told the State through their  
7 records?

8 A Well, told the State and then told consumers  
9 also. So there was two different sides to this.

10 Q But just to make sure, it did not involve an 09:37AM  
11 evaluation of the contamination at these particular  
12 dry cleaning locations?

13 A No.

14 Q Any other cases involving environmental  
15 matters? 09:37AM

16 A Not that I recall.

17 Q Okay, and the fifth case we just talked about,  
18 is that reported in your CV, sir?

19 A I believe it is.

20 Q Can you show me where? 09:38AM

21 A Yes, sir. Page 70.

22 Q Under deceptive sales practices?

23 A Yes, sir, the second one, Watkins versus Dry  
24 Cleaners International.

25 Q Looking through your CV, I just don't sense 09:38AM

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1 that there's a lot of experience you have working  
2 with contaminants in the environment. Is that a  
3 fair characterization?

4 MS. HILL: Object to form.

5 A Of course, that wasn't why I was hired, so -- 09:38AM

6 Q Can you answer the question yes or no?

7 A No, there's not a lot of experience dealing  
8 with the determination of environmental contaminants  
9 and their sources.

10 Q Other than the description of these five cases 09:38AM

11 that you just provided us, can you tell me if you  
12 have any other experience, whether it's involved in  
13 a case or not, not necessarily litigation -- I'm  
14 trying to look at experience beyond litigation --  
15 where you've done evaluation of datasets that 09:39AM

16 involve geochemical or environmental data?

17 A If you -- are you using the -- I understand  
18 the geochemical. Are you using environmental in the  
19 narrow sense of relating to how it affects the earth  
20 as opposed to environmental in terms of sociological 09:39AM  
21 concerns?

22 Q Yes, sir.

23 A Okay. Then, no, I have not had any other  
24 involvement.

25 Q Okay. So this would be your first case where 09:39AM

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1 you evaluated such a dataset as in this case?

2 A Well, keep in mind, I didn't evaluate the  
3 dataset. I evaluated Dr. Olsen's work.

4 Q Well, you did, though, did you not, comment on  
5 whether or not Dr. Olsen's dataset was reproducible; 09:39AM  
6 correct?

7 A Yes, I did.

8 Q Okay. So I guess let me restate the question  
9 this way: Is this the first time -- I hope there's  
10 no underlying -- I'm trying to make this as simple 09:40AM  
11 as possible. Is this the first dataset that you've  
12 evaluated that deals with environmental data  
13 defining environmental data the way you just did?

14 A Okay. Well, I want to be able to distinguish  
15 between evaluating the data itself, which I didn't 09:40AM  
16 look at, versus evaluating Dr. Olsen's data because  
17 he constructed his datasets from that original  
18 dataset.

19 Q Okay. Let me ask you this question then.  
20 Maybe this is a better question. Is this the first 09:40AM  
21 case where you've done a review of statistical  
22 analysis of how another expert did statistical  
23 analysis on an environmental dataset?

24 A Yes, it is.

25 Q Thank you. I knew if I got enough tries, I 09:40AM

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1 could ask a good question --

2 A Thank you, sir.

3 Q -- that got to the point. If you bear with me  
4 here today --

5 A And I appreciate it. 09:41AM

6 Q Thank you. Have you ever -- I assume this is  
7 the case. Have you ever done any microbial source  
8 tracking work?

9 A Well, I'm not exactly sure how to answer that  
10 question only because I'm not sure how you 09:41AM

11 characterize the work I did. So if I could describe  
12 a case that involved microbial source tracking, I  
13 worked on a case involving barges on the Mississippi  
14 River.

15 Q Yes, sir. 09:41AM

16 A And the question was whether or not the  
17 materials used to coat the interior of the barges'  
18 holds were adequate to keep bacteria from eating  
19 into the hulls of the boats. So what happened was  
20 that there were a series of experts pulled together, 09:42AM

21 some who were microbiologists, some who were  
22 geochemists, some who were engineers, and each  
23 person was involved in some aspect of collecting and  
24 organizing data on what the coatings were in the  
25 barges on the Mississippi, how intact were they, the 09:42AM

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1 conditions within the holds and finally the extent  
2 of pitting that had been in the barges, pitting  
3 being sort of eating away of the interior of the  
4 hull.

5 My job was to coordinate the job of everybody 09:43AM  
6 else and then analyze the data they collected. So I  
7 helped with the front end in terms of thinking about  
8 how one goes about collecting the data and what was  
9 a representative sample. I worked with --

10 Q So that was -- so in that case, was the issue 09:43AM  
11 the source of bacteria that was intruding into  
12 containers on a ship?

13 A Yes, sir.

14 Q Okay.

15 A Okay. 09:43AM

16 Q So that was the -- the bacteria you're looking  
17 at to see whether or not there was bacteria on a  
18 ship getting into containers that were being  
19 transported by that ship; correct?

20 A Well, not necessarily because the question -- 09:43AM  
21 part of the question was what had the barge owners  
22 done that would encourage the growth of bacteria,  
23 and so there's -- so there are a lot of different  
24 sources of bacteria, and the question was whether or  
25 not they had done a sufficient amount to protect the 09:44AM

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1 interior of the boat over and above the covering as  
2 opposed to the invasion, and then the question --  
3 the secondary question was, did it matter what part  
4 of the Mississippi, did it matter whether it was  
5 saltwater or not, did it matter what the boats were 09:44AM  
6 hauling, did it matter what the configuration of the  
7 boats were. So there were a lot of other factors  
8 that went into --

9 Q Is that the only experience you've had with  
10 bacteria source tracking? 09:44AM

11 A Oh, no.

12 Q Have you ever worked in a case where there's  
13 bacteria source tracking in the ambient environment,  
14 such as the issues involved in this case?

15 A Actually I'm working on a project that's not a 09:44AM  
16 case, but I'm working on two projects right now that  
17 involve the spread of different types of diseases.  
18 One is in Lima, Peru, where I'm working to study the  
19 spread of multidrug resistant tuberculosis  
20 throughout the population in Lima that would be 09:45AM

21 sourced at prisons, and then the prison structure in  
22 Lima is quite a bit different than it is here so  
23 that you have --

24 Q So you're looking at whether or not there is  
25 contaminated food and contaminated -- 09:45AM

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1 A No.

2 Q Well, so is that -- is it concern about  
3 bacteria in a prison; is that what the concern is?

4 A No. The concern is the bacteria and how it  
5 spreads through the population outside of the 09:45AM  
6 prison.

7 Q But it's people -- that people spread --

8 A Could you not interrupt me, please?

9 Q Excuse me.

10 A And I apologize. I don't mean to be harsh, 09:45AM  
11 but it's just difficult for me to get my answer out.

12 Q That's fair enough, and I'll try not to do  
13 that.

14 A Thank you. Yeah, the problem is families and  
15 the family structures and then the extended family 09:45AM  
16 structures and then how they all interrelate so that  
17 you've got multiple pathways by which tuberculosis  
18 and other related diseases can be spread.

19 Q Okay.

20 A The other work I'm doing is for the CDC and 09:46AM  
21 for the Bill Gates Foundation in Africa, where I've  
22 designed a research study to look at the spread of  
23 AIDS from mother to newborn and how interventions,  
24 different interventions can effectively stop that  
25 spread from mother to newborn depending on the types 09:46AM

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1 of drugs that are used, the care that the mother  
2 gets before the birth, the -- whether or not there  
3 is -- the mother breast feeds the baby, all the  
4 different sources of or the transmittal channels  
5 where a newborn can get AIDS from its mother, and in 09:47AM  
6 that case, I'm working with a team of pediatricians,  
7 oncologists and a variety of other doctors, but I  
8 was brought on board because they needed a  
9 statistician to coordinate the project.

10 Q And sometimes I interrupt, Dr. Cowan, because 09:47AM  
11 I'm thinking maybe we didn't communicate initially.

12 A Yes, sir.

13 Q I think my original question was, have you  
14 done any studies in the ambient environment? Do you  
15 understand what an ambient environment means? 09:47AM

16 A Could you define it for me?

17 Q Well, that would be outside, for example, in  
18 the fields and forests of the IRW, the Illinois  
19 River watershed.

20 MS. HILL: Object to the form. 09:47AM

21 Q That's what I mean by ambient environment.

22 A Well, I'm sorry. I have trouble  
23 distinguishing that between being in a city or a  
24 rural environment where -- I mean, I'm dealing with  
25 an entire country, like Zambia, where some people 09:47AM

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1 live in the city, some people live outside, but I  
2 would consider everybody to be in an ambient  
3 environment if they're giving birth.

4 Q But those issues you are dealing with there,  
5 both in Africa and in Peru, isn't the focus 09:48AM  
6 person-to-person spreading of the disease?

7 A Well, it may or may not be depending on, first  
8 of all, the disease because tuberculosis --

9 Q Well, yes or no?

10 A Okay.

11 Q Is the answer then no?

12 A Well, I was trying to give you an answer that  
13 indicated that there is no yes or no.

14 Q Okay. Were those two studies primarily  
15 epidemiological studies; would you characterize them 09:48AM  
16 as that?

17 A I'm going to fall back to the answer I gave  
18 before on the other studies. It's a combination of  
19 epidemiology and demography.

20 Q Okay. Did you read Dr. Harwood's report in 09:48AM  
21 this case?

22 A Yes.

23 Q Okay. Would you -- what I'm trying to  
24 understand is if you ever reviewed any source  
25 tracking evaluation such as Dr. Harwood did in this 09:48AM

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1 incorporated in NWIS web. This is May 2003.

2 Q Okay, and when you look at, for example, on  
3 Page 2 of the exhibit, can you identify, sir, in  
4 what sense the USGS documents using the word  
5 parameter? 09:57AM

6 A They are using it to describe variables.

7 Q Using it to describe variables?

8 A Yes.

9 Q And that's exactly how Dr. Olsen used the  
10 term; correct? 09:57AM

11 A Well, not exactly because here the word  
12 variable isn't appearing anywhere. So apparently  
13 USGS calls them parameters, but they don't use both  
14 terms.

15 Q Okay. Well, Dr. Olsen used variable 09:57AM  
16 parenthetically to make sure there was an  
17 understanding that, in at least the scientific  
18 community for environmental scientists, parameters  
19 and variables mean the same thing; correct?

20 MS. COLLINS: Object to form. 09:58AM

21 A Well, I understand that that's your  
22 allegation. I don't know what was in Dr. Olsen's  
23 mind.

24 Q Well, isn't that also how USGS is using that  
25 term? 09:58AM

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CHARLES COWAN, PhD, Volume I, 2-17-09

43

1 A Not on this page.

2 Q You just testified that USGS is using the term  
3 as you would use the word variable; correct?

4 MR. TODD: Object to form.

5 A Okay. You're asking me something slightly 09:58AM  
6 different. I just indicated a minute ago that they  
7 used the word parameter to substitute for variables.

8 Q So do you believe that USGS is likely using  
9 the word parameter in the same way that Dr. Olsen  
10 uses the word parameter in his report? 09:58AM

11 A It's possible.

12 Q I have a question. Would you turn to  
13 Paragraph 3 of your report, sir?

14 A Okay. I'm sorry. Do you want me to keep this  
15 or would you like me to give it to -- 09:59AM

16 Q We can just set it right here in front of you.

17 A Yes, sir.

18 Q And then sometimes we go back to previous  
19 exhibits.

20 A Okay, and I'm sorry, where would you like me 09:59AM  
21 to turn now?

22 Q Paragraph 3.

23 A Okay, sir.

24 Q Would you read Paragraph 3 for me, please?

25 A I'm sorry. I'm not there yet. 09:59AM

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1 A No, sir.

2 Q Have you ever used principal component  
3 analysis in your professional work?

4 A Yes, sir.

5 Q Could you explain to me in general terms the 10:38AM  
6 applications in which you've used principal  
7 component analysis?

8 A Sure. Do you want a short list or the full  
9 list?

10 Q Could you kind of categorize how you used it? 10:38AM

11 A Sure. Remember earlier we were talking about  
12 my graduate students?

13 Q Yes.

14 A My most recent graduate student is using  
15 principal components analysis on a survey conducted 10:38AM  
16 in Honduras to look at -- she's conducting a  
17 behavioral analysis to determine whether she can  
18 find ways to help workers stem the flow of multidrug  
19 resistant Tuberculosis in the Honduras.

20 Q I'm going to apologize for interrupting. 10:39AM

21 A You bet.

22 Q But can you tell me applications where you  
23 used PCA in your own work, not maybe working with  
24 someone else? For example, have you done any  
25 studies yourself where you've used principal 10:39AM

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1 component analysis?

2 A Okay. Just to conclude what I was saying,  
3 however, I will say that I consider that my own  
4 work. I'm advising a doctoral student, but if  
5 you're asking me if I've done the work as opposed to 10:39AM  
6 working with somebody else, actually the very first  
7 work that I did was for the National Science  
8 Foundation doing an analysis of economic data for a  
9 country to determine sort of sources and flows of  
10 income and how the economy within that country 10:40AM  
11 operated, somewhat like the structure of our own  
12 national income accounts.

13 Since then I've used principal components, for  
14 example, in a -- in studies of samples of people to  
15 determine whether or not you could use principal 10:40AM  
16 components and its adverse Mahalanobis distances for  
17 sampling purposes for construction of samples using  
18 controlled selection. I've used it in a financial  
19 context where we've looked at, for example, stock  
20 data. You've got lots of different types of stocks, 10:40AM  
21 and the question is if you are trying to invest in  
22 stocks, how do you classify them together or apart  
23 and is there a more efficient way to classify stocks  
24 relative to other methods of creating equity within  
25 a firm? Those types of analyses are to determine 10:41AM

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1 the structure of financial markets. So a lot of  
2 different applications.

3 Q So has your work in the -- with PCA been  
4 primarily involving studies within the social  
5 sciences? 10:41AM

6 A Yes.

7 Q Okay. Have you ever done any work with PCA in  
8 the non-social sciences?

9 A That seems so harsh. We could call them less  
10 social. 10:41AM

11 Q How would you call it?

12 A I understand what you meant. What are  
13 commonly referred to as the hard sciences.

14 Q Yes, sir.

15 A Well, only in the sense of deal with it from,  
16 you know, pure mathematical, which really isn't the  
17 social sciences, but if you're talking about like  
18 physics, chemistry and so on, no.

19 Q Or geochemistry?

20 A No. 10:42AM

21 Q What about samples involving environmental  
22 contaminants?

23 A Could you be a little bit more explicit?

24 Q Well, like in this case where Dr. Olsen was  
25 reviewing samples of -- environmental samples and 10:42AM

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1 testing it for different parameters, geochemical  
2 parameters; correct?

3 A Uh-huh.

4 Q Have you done any kind of PC analysis with a  
5 dataset similar to Dr. Olsen's?

10:42AM

6 A No.

7 Q Have you published any peer-reviewed articles  
8 concerning principal component analysis, whether  
9 it's the social or hard sciences?

10 A Well, there was a report to the National

10:42AM

11 Science Foundation. So they published it, I didn't  
12 publish it, although that was a really long time  
13 ago, and then there are two papers in my resuM that  
14 are -- describe the use of Mahalanobis distances,  
15 which is the adverse of principal components, for  
16 essentially attempting to do controlled selection --  
17 use of controlled selection methods in sample  
18 surveys.

10:43AM

19 Q And what kind of survey was involved; was it a  
20 social sciences survey?

10:43AM

21 A No. This was for the Bureau of the Census.  
22 So it would be in general any of the surveys that  
23 they do.

24 Q People population surveys?

25 A No, sir. At least half or more of the work

10:43AM

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1 A Well, you asked me if I had to study the use  
2 of PCA in environmental cases, and I took your have  
3 to meaning it was an absolute must to be able to  
4 understand PCA. PCA is a common technique that's  
5 been used for a very long time, and I've used it  
6 throughout my career. So if you're asking me if I  
7 had to study PCA, no.

10:45AM

8 Q Okay. Let me ask you this then: Would you  
9 agree that the application of PCA to environmental  
10 sciences is somewhat different than when you apply  
11 it to the work you've done in the social sciences?

10:45AM

12 A No.

13 Q You say it's the same methodology?

14 A Well, mathematically, the mathematics aren't  
15 going to change.

10:45AM

16 Q You don't think there's any unique attributes  
17 of doing work in environmental science data that  
18 would be important for you to appreciate prior to  
19 evaluating Dr. Olsen's work in this case?

20 A Well, let me put it in perspective. What Dr.  
21 Olsen did was he did his analysis using a program  
22 called SysStat, which is one of the programs we use,  
23 and SysStat doesn't ask if it's environmental. It  
24 just runs the program.

10:46AM

25 Q Okay, and you're --



1 A So the mathematic -- I apologize because I  
2 interrupted you, but just I wanted to conclude by  
3 saying the mathematics are exactly the same.

4 Q Okay, but in your use of PCA, isn't it  
5 important to have an understanding of the types of 10:46AM  
6 data that are involved in the PCA analysis in order  
7 to interpret that data?

8 A Well, that's why we reconstructed all of Dr.  
9 Olsen's datasets.

10 Q But did you come to an evaluation and 10:46AM  
11 understanding of the type of data that was involved?

12 A Well, I came to some understanding of the type  
13 of data. I'm not putting forth -- myself forth as a  
14 chemist, a biologist or anything else, but, you  
15 know, when I work with doctors and I design research 10:46AM  
16 for them, I'm not putting myself forth as a  
17 physician, but that doesn't mean that my work isn't,  
18 you know, valuable in terms of understanding the  
19 transmission of diseases.

20 Q Did you do any additional study of PCA 10:47AM  
21 applications in environmental forensics prior to  
22 doing your work in this case?

23 A I did.

24 Q And what did you do?

25 A Well, I'm sorry. I'd like to amend just the 10:47AM

1 word prior. I did it concurrently.

2 Q Okay, and what did you do?

3 A Well, I -- first, I read Dr. Johnson's chapter

4 in the book that he published. I also read a text

5 book by a Professor Jeliffe, J-E-L-I-F-F-E I 10:47AM

6 believe, that has a couple of chapters on use of PCA

7 in environmental work. I looked at other articles

8 that had been referenced that use PCA in

9 environmental work, and I believe that there's an

10 example also given in geology, another of the hard 10:48AM

11 sciences, not in Harmon's textbook but in a third

12 textbook I have and, I'm sorry, I can't remember the

13 name of that one.

14 Q And why did you do that review and evaluation?

15 A Just to understand what other -- to put the 10:48AM

16 analysis in context and understand what was commonly

17 done in that field as opposed to my field.

18 Q Did you find that to be important in review of

19 PCA analysis?

20 A No, sir. 10:48AM

21 Q So you don't think it was important to know

22 what the common practices are, for example, in the

23 environmental science field as opposed to your field

24 in order to understand whether the environmental

25 scientists properly employed PCA? 10:48AM

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1 A From a mathematical perspective, what I found  
2 in reviewing -- you asked me if it was important.  
3 The reason it wasn't important was because I didn't  
4 learn anything new in reading those articles or the  
5 journals or the books that I didn't already know in 10:49AM  
6 terms of the mathematical application. So it  
7 couldn't be important if I wasn't learning something  
8 new or different. There wasn't anything different.

9 Q Do you have any experience prior to this case  
10 in transforming environmental sampling data? 10:49AM

11 A Remember the barge case we were discussing  
12 before?

13 Q Okay.

14 A I had to do transformations on that data and  
15 deal with some of -- well, I had to do 10:49AM  
16 transformations on that data.

17 Q What kind of transformations did you use?

18 A Some cases logarithmic and other cases  
19 calculation of logistic values, which is -- uses a  
20 log but there's a further set of transformations 10:50AM  
21 involved.

22 Q Was it a Log10 transformation?

23 A I believe it was, yes.

24 Q Okay, and why did you do the transformation in  
25 that particular case? 10:50AM

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1 expansive to cover whatever it was.

2 Q What about the second type of discussions  
3 where you talked about overlaps; did he make any  
4 changes in his reports based on these overlap  
5 discussions you just testified to? 11:34AM

6 A No, sir, because when we discussed it, we  
7 discussed that although we were overlapping, that it  
8 was probably just fine, that redundancy in some  
9 cases is a good thing.

10 Q Did you make any alterations to your report 11:34AM  
11 based on any of your discussions with Dr. Johnson?

12 A The only -- I didn't really make changes. I  
13 acquired a better understanding from Dr. Johnson  
14 about the multiplicity of tests that could be  
15 performed and one -- what non-detect levels -- or 11:34AM  
16 what non-detect levels I would likely see. So I  
17 gained a better understanding of non-detect levels  
18 from speaking with Dr. Johnson.

19 Q Did you not understand what a non-detect meant  
20 in -- 11:34AM

21 A Oh, no.

22 Q -- environmental data before your discussions  
23 with Dr. Johnson?

24 A I apologize for interrupting you. No. I  
25 understood perfectly what a non-detect was because 11:35AM

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1 we see that frequently in biostatistics, too. What  
2 I wanted to know about was the specific tests and  
3 what a non-detect level would be for different tests  
4 of the same analyte.

5 Q Okay, and did you -- what did you learn new 11:35AM  
6 from Dr. Johnson in your discussion on non-detects?

7 A That there were different levels of precision  
8 for different types of tests for the same analyte,  
9 and that sometimes there was a preferred test and  
10 sometimes there wasn't. 11:35AM

11 Q I think we're going to come back to that  
12 subject in a minute, but before we go there, could  
13 you summarize for me today what your opinions are  
14 that are contained in your report?

15 A Certainly. May I refer to my report? 11:35AM

16 Q Yes, sir.

17 A Thank you.

18 Q What I'm trying to do is understand what your  
19 key opinions are in the case.

20 A Okay. I realize there was one other change 11:36AM  
21 that I made to the report after speaking with Dr.  
22 Johnson, and that was simply that I expanded the  
23 section that I had on strength of relationship.

24 Q Can you be a little more specific what you  
25 mean by strength of relationship? 11:37AM

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1 dealing with standardized data, in which case it is  
2 the mean.

3 Q If you are looking for loadings, though,  
4 aren't you trying to determine whether or not that  
5 particular analyte has a particular impact on that 12:00PM  
6 sample, so zero represents a no impact for the  
7 sample; correct?

8 MR. TODD: Object to form.

9 A Well, it sort of depends on when and where  
10 you're substituting to zero. It was -- we were just 12:00PM  
11 talking a minute ago, it depends on whether or not  
12 it's a standardized value. It depends on whether  
13 the analyte is important or not important on that  
14 particular principal component. I mean, there are  
15 all sort of other factors that you'd have to 12:00PM  
16 consider before you decide whether or not zero is  
17 important or not.

18 Q We'll come back to that.

19 A Okay.

20 Q Are there anything else -- is there anything 12:00PM  
21 else that you would add to this list of key  
22 criticisms you have in Dr. Olsen's report?

23 A Let's continue. Okay. On Page 26, I have a  
24 brief discussion of the non-detects.

25 Q Uh-huh. 12:01PM

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1 A And I'm going to come back to this later, but  
2 the problem with the non-detects is that because  
3 non-detect limits differed even for the same analyte  
4 because of different test readings. That adds  
5 variability to the dataset. That wasn't accounted 12:01PM  
6 for.

7 Q So you suggest here on Page 26 that  
8 non-detects should be treated as zero?

9 A Well, that wouldn't be possible.

10 Q Well, you say rather than treat this as zero 12:01PM  
11 non-detect, Dr. Olsen substitute the midpoint  
12 between zero and the detect limit for the chemical;  
13 correct?

14 A That's what I say.

15 Q So what is your criticism? 12:02PM

16 A Well, my criticism is that it's not that there  
17 is a systematic -- it's not that there is a value  
18 substituted for the non-detect; it's that the values  
19 vary for even the same analytes. So I give an  
20 example, I believe, for aluminum where you've got 12:02PM  
21 different non-detect limits, and if there wasn't --  
22 this wouldn't be an issue if the log transforms  
23 weren't taken, but once you take the logarithms,  
24 those numbers blow up into very large numbers.

25 Q Okay. What else? 12:02PM

1 having first been duly sworn to testify the truth,  
2 the whole truth and nothing but the truth, testified  
3 as follows:

4 CONTINUED DIRECT EXAMINATION

5 BY MR. PAGE: 08:33AM

6 Q Good morning, Mr. Cowan. I'd like to remind  
7 you you are still under oath today to tell the truth  
8 and the whole truth.

9 A Thank you. Good morning, Mr. Page.

10 Q Yesterday we spent some time talking about 08:33AM  
11 substitution of mean values and data. Do you recall  
12 that discussion?

13 A Yes, sir.

14 Q And was it -- would I be summarizing your  
15 testimony correctly by saying that you believe that 08:33AM  
16 SysStat automatically substitutes the means of a  
17 variable for a missing data or the empty cell when  
18 you select pairwise deletion?

19 MR. TODD: Object to the form.

20 A That's actually not what I said. What I said 08:33AM  
21 was, the effect of what SysStat does is like what  
22 you just said but, in fact, what's happening is that  
23 since the means are all zero because we're dealing  
24 with a correlation matrix, so the data is all  
25 standardized, that the fact that whether you did it 08:34AM

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1 by substituting the means, which is what you just  
2 described, or whether you just do the calculation on  
3 the data where you have observations on both  
4 variables, the effect is the same because if you  
5 were to substitutes the means, you would just be 08:34AM  
6 adding the zeros and so it wouldn't change the  
7 numerators or the denominators in terms of its  
8 values.

9 Q But it's your -- I'm sorry. Excuse me.

10 A Well, the only thing I wanted to add is, 08:34AM  
11 there's only one slight difference and that has to  
12 do with the denominators and the ratios that we  
13 discussed yesterday, which are the sample sizes.

14 Q Okay. Let me make sure I understand what  
15 you're saying. Are you suggesting that SysStat 08:34AM  
16 actually plugs in a zero for that missing data and  
17 then does the correlation on that analyte for that  
18 sample where there's missing data?

19 A No, sir. What I said was the effect of the  
20 way they do the calculation is the same as if you 08:35AM  
21 did that, but I'm not saying that SysStat does that  
22 because it would be highly inefficient  
23 computationally. What SysStat does is it only uses  
24 the observations for which it has values on both  
25 variables, but if you were to continue down -- you 08:35AM

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1 have two columns of numbers. If you were to  
2 continue down those columns and wherever you have a  
3 missing value, you plugged in the mean, which is  
4 zero, and then summed those values, you'd still come  
5 to the same summation. 08:35AM

6 Q I just want to make sure we're speaking the  
7 same language here. Last night I was able to get  
8 some materials from the SysStat operating manual,  
9 and I want to show those to you and discuss them.

10 A Okay.

11 Q Here is Exhibit No. 22. Have you ever  
12 reviewed the SysStat operating manual?

13 MR. TODD: May I interrupt for just a  
14 second? We promised Melissa we'd give a little  
15 description of the exhibits. 08:36AM

16 MR. PAGE: Thank you. I'll do my best.

17 MR. TODD: Thanks.

18 Q This is a three-page exhibit that was taken  
19 from the SysStat operating manual, and it's labeled  
20 Cowan Deposition Exhibit No. 22. Do you agree with  
21 my description there, Dr. Cowan? 08:36AM

22 A Yes, I do.

23 Q Okay, and if you look at the second page, it  
24 refers to deletion methods. Do you agree with that?

25 A Yes. 08:36AM

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1 Q Okay. Would you read the first paragraph  
2 under deletion methods on the second page?

3 A The two most common deletion methods are  
4 listwise and pairwise deletion. In listwise  
5 deletion the analysis used complete cases only. 08:37AM  
6 That is, the procedure removes from computations any  
7 observation with a value missing on any variable  
8 included in the analysis.

9 Q Okay. Let's focus on the first sentence. I  
10 want to make sure we're speaking the same language, 08:37AM  
11 Doctor. It talks about listwise and pairwise  
12 deletion, and do you agree that Dr. Olsen  
13 implemented pairwise deletion when he ran SysStat  
14 with the missing values?

15 A Well, since I don't have his code, the exact 08:37AM  
16 code that he ran, I don't know that 100 percent, but  
17 it appears to me that he ran that option as opposed  
18 to listwise.

19 Q Did you testify yesterday -- I just want to  
20 confirm this -- that you were able to exactly 08:37AM  
21 reproduces Dr. Olsen's results by running a pairwise  
22 deletion by SysStat?

23 MR. TODD: Object to form.

24 A No, that's not what I said. That was actually  
25 in the document that you showed me from Dr. Murphy. 08:38AM

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1 What I said was that I was able to exactly reproduce  
2 his results by plugging in the means.

3 Q And you plugged in the means. What do you  
4 mean by that?

5 A I sub -- any time I had a missing value, I 08:38AM  
6 substituted the mean value.

7 Q Of all the non-missing variables, you meaned  
8 those, so you got the average of that variable where  
9 you had data available for the other observations?

10 A Yes. Your first second -- your first sentence 08:38AM  
11 wasn't quite accurate, but your second sentence was  
12 exactly correct.

13 Q Okay. So you found that by -- you actually  
14 ran the database by substituting the mean values for  
15 the missing data; correct? 08:38AM

16 A Yes, sir.

17 Q Did you ever run the database without doing  
18 that by just doing pairwise deletions?

19 A I did once.

20 Q And did they -- were they -- is it your 08:38AM  
21 testimony, sir, that those two results, that is,  
22 when you substituted the mean value and when you ran  
23 pairwise deletion, were exactly the same?

24 A Well, remember, we talked about within decimal  
25 places. 08:39AM

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1 Q Yes.

2 A Like within -- out to the fourth decimal  
3 place, so you wouldn't really observe a difference.

4 Q Okay. Now, what is listwise deletion? Is  
5 that not where if you're missing a value or variable 08:39AM  
6 or sometimes we call it parameter for a particular  
7 observation or a sample, then the SysStat program  
8 completely eliminates that sample or that  
9 observation when it runs its correlations; correct?

10 MR. TODD: Object to form. 08:39AM

11 A Well, it doesn't eliminate it. It's still in  
12 the database. It just doesn't use it in the  
13 calculation.

14 Q Thank you.

15 A Okay. 08:39AM

16 Q That clarification, thank you, and with  
17 pairwise deletion, what it does is, it does not run  
18 a correlation for any analyte or for any analyte  
19 within an observation where there is a blank cell or  
20 it's missing data; is that correct? 08:40AM

21 A No, sir. You -- not the way you described it.  
22 What it does is, it does a calculation for each pair  
23 of variables, but it does a separate calculation for  
24 each pair of variables using only those observations  
25 where you have -- only -- yes, only those 08:40AM

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1 observations where you have both values present.

2 Q So I was correct in my statement?

3 A No. The way you described it, the -- you  
4 can't do that on a computer. So the way I described  
5 it is the way that the calculation is actually done. 08:40AM

6 Q Well, let's continue on here. So the second  
7 sentence on the paragraph -- the first paragraph is  
8 -- states that that the procedure removes from  
9 computations any observation with a value missing on  
10 any variable included in the analysis. Doesn't that 08:40AM  
11 indicate, sir, that if you have a missing data piece  
12 on a variable, it simply does not run a correlation  
13 for that variable from that observation?

14 MR. TODD: Object to form.

15 A The reason I'm having trouble with your 08:41AM  
16 wording is that running the correlation is done on  
17 all the observations. What I believe you mean is  
18 that it's not including in the calculation of the  
19 correlation any pair that's missing the cell value  
20 on one variable or the other. 08:41AM

21 Q Okay. So let me see if I can get an example  
22 where we might have a meeting of minds here. If  
23 there are -- say there's 74 observations.

24 A Yes, sir.

25 Q And 71 of them have complete observations but 08:41AM

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1 three of them do not.

2 A Yes, sir.

3 Q Okay. So that when you run the correlations  
4 on the analyte for the 71 that have the missing  
5 data, you're really going to have an end of 71 for 08:42AM  
6 that analysis; is that correct?

7 A That is correct check that.

8 Q Would you show me in here -- no. Let me  
9 strike that. So yesterday when you testified that  
10 -- and I believe you testified to this and, of 08:42AM  
11 course, the Record will reflect if I'm wrong -- that  
12 the SysStat program automatically substituted the  
13 mean values, what you're saying today is, is that it  
14 doesn't automatically substitute the mean values,  
15 but if you did the computations, the results would 08:42AM  
16 be the same?

17 MR. TODD: Object to form.

18 A Actually what I believe I said was that the  
19 effect of that calculation is the same.

20 Q Did you say you confirmed these results by 08:43AM  
21 using SSOE program?

22 A I said SPSS. SSOE, I have no idea.

23 Q I'm working with an engineering firm called  
24 SSOE, and I confused the terms. SPSS?

25 A Yes, sir, and I understand the confusion on 08:43AM

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1 acronyms.

2 Q Are you telling me today you confirmed that  
3 with the SSOE -- SS -- I should get it in front of  
4 me then I won't forget.

5 A That's okay.

6 Q SPSS?

7 A Thank you. Yes, sir, I did.

8 Q Okay, and did you get the exact same results  
9 as when you ran pairwise deletion or SysStat without  
10 substituting the mean values?

08:43AM

11 MR. TODD: Object to form.

12 A I'm not sure I did that calculation using both  
13 systems. What I did was I ran the SPSS results on  
14 the original results that Dr. Olsen got in SysStat  
15 and I reran it in SPSS.

08:44AM

16 Q Okay. When you compared Dr. Olsen's results  
17 from SysStat when you employed pairwise deletion --

18 A Yes.

19 Q -- and compared that to SPSS, were they the  
20 same results?

08:44AM

21 A And that's what I was saying yesterday.  
22 They're the same out to the fourth decimal place,  
23 and you would expect, since you have two different  
24 programs and different two operating systems, that  
25 there be would a little fuzz out there on the edges.

08:44AM

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1 Q And is it your understanding, sir, that SPSS  
2 has a pairwise deletion function that operates in  
3 the same way as the SysStat pairwise deletion  
4 function?

5 A Yes, sir. 08:44AM

6 Q In your report when you state, I think at  
7 several occasions, that Dr. Olsen substituted mean  
8 values, would it be more precise to say that you  
9 believe that Dr. Olsen's methodology in SysStat had  
10 the effect of substituting mean values? 08:45AM

11 A Well, I wouldn't use the word methodology, but  
12 the remainder of your statement is correct, that  
13 it's the effect of using that default, which has the  
14 same effect as substituting the means.

15 Q But -- but Dr. Olsen employed -- rather than 08:45AM  
16 actually doing what you did, which was I guess to  
17 take the means of the data and then plug them in to  
18 those parameters -- excuse me, to those observations  
19 for the missing parameters --

20 A Yes, sir. 08:45AM

21 Q -- he simply loaded those observations with  
22 the missing data in to SysStat and selected pairwise  
23 deletion and let the program come to the results; is  
24 that correct?

25 MR. TODD: Can I interrupt for a second? 08:46AM

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1 Are you posing this as a hypothetical as to what Dr.  
2 Olsen did?

3 MR. PAGE: That's a question; that's a  
4 question.

5 MR. TODD: Okay, and you're testifying as 08:46AM  
6 to what Dr. Olsen did here?

7 Q Well, I thought we've already established that  
8 you believe that Dr. Olsen used pairwise deletion,  
9 that you ran it. Am I mistaken on that?

10 A No. I said that I was able to replicate his 08:46AM  
11 results, and so he could have gotten those results  
12 doing either of the procedures.

13 Q That's if you're correct in saying that the  
14 mean values do actually create -- if you substitute  
15 the mean values, you actually get the same results 08:46AM  
16 as pairwise deletion; correct?

17 A If --

18 Q If that's true?

19 A If that's true?

20 Q Yes. 08:46AM

21 A Then, yes.

22 Q So are you testifying you really don't know  
23 what Dr. Olsen ran when he ran SysStat?

24 A No. What I'm testifying is that it doesn't  
25 matter because mathematically, they're identical. 08:46AM

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1 Q Well, answer the question, though, please,  
2 sir. Do you know -- can you testify today whether  
3 Dr. Olsen substituted mean values or ran pairwise  
4 deletion when he ran his PCA with data that had  
5 missing variables?

08:47AM

6 A No, because Dr. Olsen didn't provide any of  
7 the summary documentation that tells me how he ran  
8 his programs.

9 Q So let me go back to my original question then  
10 before the objection. So what you're stating today  
11 is that you don't know how Dr. Olsen ran his PCA  
12 with the missing observations?

08:47AM

13 A Yes, that's what I'm saying.

14 Q So on Page 23, for example, of your report --

15 A Yes, sir.

08:48AM

16 Q -- Paragraph 54, would you turn to that,  
17 please?

18 A Sure. Paragraph 23?

19 Q Yes, sir.

20 A I'm sorry, Page 23, Paragraph 54? I messed  
21 up.

08:48AM

22 Q I did, too, by saying yes, sir. It's  
23 Paragraph 54, Page 23.

24 A Yes, sir.

25 Q Second sentence, when you say when he is

08:48AM

1 Q Are you telling me and this court that what I  
2 just said and what I said in layman's term is  
3 different than our definition of sensitivity and  
4 specificity?

5 A Okay. Well, what I understood you to say was 11:31AM  
6 that she was trying to determine the presence or  
7 absence of the biomarker in poultry litter, let's  
8 say, and what I'm saying is that that's not what  
9 this paragraph is talking about. This is a jargon  
10 paragraph that talks about the statistical 11:31AM  
11 properties of the test being conducted but not the  
12 statistical outcomes.

13 Q I see. So you're looking at a specific  
14 paragraph of Dr. Harwood's report that you think  
15 that she's talking about statistical analysis? 11:31AM

16 A Well, since that's what she's doing and since  
17 that's how she uses the terms as she goes forward,  
18 yes.

19 Q I want to make sure I understand your  
20 testimony from yesterday with regard to your 11:31AM  
21 experience with bacteria.

22 A Yes.

23 Q Am I correct in remembering that the only  
24 study, investigation you've worked on with regard to  
25 bacteria was the one involving the bacteria on the 11:32AM

1 ship?

2 A Yes.

3 Q And am I also correct in remembering that in  
4 that work that you did on bacteria on the ship, it  
5 did not involve bacteria originating from either  
6 human or animal feces?

11:32AM

7 A I'm sorry, I was listening to the question but  
8 I got lost in the middle, so could we just repeat  
9 the question?

10 Q Absolutely.

11:32AM

11 (Whereupon, the court reporter read  
12 back the previous question.)

13 A Oh, no, that's not true. That was considered  
14 as a source and, in fact, in the waste products  
15 found in the hollows in the barges, the -- I don't  
16 know how to describe them but they're what keep the  
17 barges afloat, so they're supposed to be completely  
18 empty and dry. They frequently found both human  
19 feces and then feces that had come in through water  
20 that had come over the side of the barge and into  
21 the hollows, and there were very specific tests for  
22 the presence of feces, fecal coliform, all that good  
23 stuff.

11:32AM

11:33AM

24 Q So that you found from the ambient ocean  
25 waters bacteria that got in, I guess, what, the

11:33AM

1 bilge waters of the ship?

2 A Yes, except the Mississippi River so it --

3 Q Mississippi River?

4 A Yes.

5 Q Fresh waters had bacteria in them? 11:33AM

6 A Yes.

7 Q And they identified those as both animal and  
8 human originating bacteria?

9 MR. TODD: Object to form.

10 A Well, I'm not sure they identified them as 11:33AM  
11 animal or human, but it was quite obvious in some  
12 cases it was human.

13 Q Okay, and so how did you draw the conclusion  
14 that in some cases they were animal manures?

15 A I didn't, and there wasn't a specific test for 11:34AM  
16 that, but I'm just pointing out the fact that since  
17 water is flowing over the sides of the ship, I don't  
18 know how animal manure would be kept out separately  
19 from -- and you'd only have human.

20 Q Is it your understanding -- what tests did you 11:34AM  
21 run; what bacterial tests did you run?

22 A I don't know. I didn't run the tests.

23 Q So you wouldn't be able to tell us anything  
24 about how you identified bacteria from humans or not  
25 humans; correct? 11:34AM

1 Q Can you tell us how many different farms these  
2 samples originated from?

3 A I don't recall that either, but I'm -- I know  
4 it's got to be less than or equal to ten.

5 Q That -- your math has served you well, sir. 11:44AM

6 A Thank you.

7 Q Wouldn't that type of information be important  
8 for your understanding of your opinions in this case  
9 with Dr. Harwood, the number of samples of poultry  
10 farms, how many were positive and whether they were 11:45AM  
11 different farms or the same farm?

12 MR. TODD: Object to form.

13 A No, sir.

14 Q Why not?

15 A Okay. First of all, if I gave you everything 11:45AM  
16 that you could possibly hope for, that it was ten  
17 independent completely unrelated farms, so that  
18 would eliminate clustering, okay, and then on top of  
19 that you told me that all ten of them showed that  
20 there was a biomarker, okay? That tells me 11:45AM  
21 virtually nothing about what is actually happening  
22 in the population because I don't know from a sample  
23 of size ten whether that really means it's 100  
24 percent or some significantly lower number with any  
25 confidence because of the nature of the sampling. 11:46AM

1 Q What do you mean by that, the nature of the  
2 sampling?

3 A Okay. If, for example, the presence or  
4 absence of a biomarker was -- let's say that a  
5 biomarker was present 80 percent of the time, it 11:46AM  
6 would be highly likely to take a sample of ten and  
7 have all ten of them show the presence of the  
8 biomarker even though only 80 percent of the poultry  
9 had the biomarker in it, and that's actually true  
10 for 80 down to 70 down to 60, and we could 11:46AM  
11 calculate --

12 Q But -- I understand. What is it about the  
13 sampling that makes you draw the conclusion?

14 A It's just the nature of sampling theory.

15 Q It's just like a theoretical basis that any 11:47AM  
16 number of samples, only 80 percent of them will  
17 probably actually be representative of what you  
18 actually identified from your analysis?

19 A Well, actually from sampling theory, you can  
20 calculate the likelihood of seeing any particular 11:47AM  
21 outcome for any level of presence of biomarker. So  
22 we could sit down and do that calculation if you  
23 like.

24 Q So how many samples would you have recommended  
25 to Dr. Harwood that you take? 11:47AM

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1 A It would depend on --

2 Q Of the poultry litter?

3 A Of the poultry litter, and I understood that.

4 I would only need to actually know one thing from

5 Dr. Harwood, which is what level of presence are you 11:47AM

6 measuring against. So in other words, if she gave

7 me a defining cutoff and said I'd like to know that

8 more than 65 percent or more than 80 percent of the

9 poultry contained this biomarker, then I could tell

10 her what size sample to select, but I need to know 11:48AM

11 that number.

12 Q So a size sample of -- in your sampling theory

13 example, a sample size of ten would result in what

14 under your sampling theory presence?

15 A Well, that's the problem. A sample of size 11:48AM

16 ten would mean that it could be anywhere -- I could

17 observe that they all have the biomarker, but I

18 still don't know that I necessarily have a presence

19 that's higher than 80 percent.

20 Q So that would -- if you have a sample of ten, 11:48AM

21 you can only, under your sampling theory, assume a

22 presence of 80 percent; is that what you're telling

23 us?

24 MR. TODD: Object to form.

25 A Well, I'm using 80 percent as a hypothetical. 11:48AM

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1 Q I was asking you what -- not using a  
2 hypothetical, tell us what the results are for a  
3 sample size of ten.

4 A Oh, I'd have to sit down and do the  
5 calculations, but it's a pretty straightforward 11:49AM  
6 calculation.

7 Q And I assume we don't have the right  
8 calculator here with us today either?

9 A Nope. I do.

10 Q You want to do the quick calculation on that, 11:49AM  
11 please?

12 A Yeah. I'll warn you, it will take me about  
13 ten minutes. If you'd like me to do it during the  
14 break --

15 Q Would you mind doing it during the lunch hour? 11:49AM

16 A No. I'd be happy to.

17 Q Thank you. You didn't provide that  
18 information in your report somewhere, did you?

19 A Actually I addressed that issue and the other  
20 issue about the presence or absence of the biomarker 11:49AM  
21 in species that aren't poultry in paragraphs --

22 Q I'm talking about the issue we were just  
23 talking about.

24 A And that's what I'm looking at.

25 Q Thank you. 11:49AM

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1 one of two duplicate goose samples had a detect for  
2 the biomarker?

3 A Yes.

4 Q Okay, and do you recall that was the only  
5 detection for a non-target species with the  
6 biomarker?

01:28PM

7 MR. TODD: Object to form.

8 A I don't remember that but --

9 Q Okay. Do you know whether or not that  
10 detection was by nested or qPCR?

01:29PM

11 A I don't remember.

12 Q So you don't know whether that detection was  
13 by the most sensitive method or not?

14 A I don't know.

15 Q Before lunch, a little before lunch, I asked  
16 you to do a calculation for me.

01:29PM

17 A Yes, sir.

18 Q Did you have an opportunity to do that?

19 A I did.

20 Q Could you provide me your results?

01:29PM

21 A Sure, but let me repeat what it was that I  
22 thought I was calculating just so we're talking  
23 about the same thing.

24 Q That would be helpful. Thank you.

25 A Okay. As I understood it, what you were

01:29PM

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1 asking me was if I had a sample of size ten and in  
2 the hypothetical we were discussing all ten of those  
3 samples showed the biomarker, what was the  
4 probability -- could I state what the lower bound of  
5 the probability was that the biomarker was in 01:30PM  
6 whatever the target population is?

7 Q Yes, sir.

8 A Is that reasonable?

9 Q Yes.

10 A And the answer is, the number could be 01:30PM  
11 anywhere between 63 percent and 100 percent.

12 Q Okay. Thank you for doing that calculation on  
13 your lunch hour.

14 A Sure.

15 Q Do you have an opinion, Dr. Cowan, as to how 01:30PM  
16 the use of a composite sample would influence or --  
17 let me see if I can say -- withdraw that. Let me  
18 ask it this way: How would using a composite sample  
19 when the sample is collected with the objective of  
20 proving that the potential biomarker was not present 01:31PM  
21 in that composite species of manure affect the  
22 interpretation of the data?

23 A This is what we were discussing before in  
24 terms of clustering. What's happened is that we  
25 have taken a sample however -- just for the sake of 01:31PM

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